INSTRUCTION MANUAL

REGULATED POWER SUPPLIES

MODEL LM

A PACKAGE

THIS MANUAL APPLIES TO UNITS

BEARING SERIAL NO. PREFIXES A-C

MP MASTER
MA28762

LAMBDA

LAMBDA ELECTRONICS CORP.-MELVILLE, L. I., N. Y.

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FOR

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This manual provides instructions intended for the operation of Lambda power supplies, and is not to be reproduced without the written consent of Lambda Electronics Corp.

LAMBDA ELECTRONICS CORP. MELVILLE, L.I., N.Y.

MAIN PLANT TELEPHONE: 516 MYrtle 4-4200

IM-LMA

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SPECIFICATIONS AND FEATURES

The following specifications apply for all Lambda A package LM power supplies. Specification exceptions noted here relate to models incorporating model option "Y" and/or "T". Performance specifications do not change for models with suffix "R", e.g., LM-251R unless the models also include model options "Y" and/or "T" e.g., LM-251YR; for these models the appropriate specification exceptions also apply.

NOTE: Specifications in italics apply only for Lambda models with a "Y" suffix, e.g., LM-251Y. AC INPUT specification with an asterisk*, applies only for Lambda models with a "T" suffix, e.g., LM-251YT.

DC OUTPUT--Voltage regulated for line and load

Voltage Range.... For voltage range see table I of pertinent model group.

Multi-Current Ratings.... Current ratings specified for each maximum ambient temperature apply over entire output voltage range, with input frequency 55-65 cps. For input frequencies 45-55 at 105-132 VAC or 200-250 VAC, derate maximum current ratings 10% at all ambient temperatures.

For input frequencies 360-440 cps, at 105-132 VAC or 200-250 VAC, derate maximum current ratings 10% at all ambient temperatures.

Consult factory for current ratings on models LM-267, LM-268 with input frequencies 360-440 cps.

For maximum current ratings at each ambient temperature see table I of pertinent model group.

REGULATED VOLTAGE OUTPUT

Regulation (line). . . Less than 0.05 percent plus 4.0 millivolts for input variations from 105-132 or 132-105 volts AC
... Less than 0.01 percent plus 1.0 millivolt for input variations from 105-132 or 132-105 volts AC

Regulation (load)... Less than 0.03 percent plus 3.0 millivolts for load variations from 0 to full load or full load to 0
... Less than 0.02 percent plus 2.0 millivolts for load variations from 0 to full load or full load to 0

Remote Programming

External Resistor... Nominal 200 ohms/volt output

Programming Voltage... One-to-one voltage change

Ripple and Noise... One millivolt rms; 3 millivolts peak-to-peak with 60 cps input
... 0.5 millivolt rms; 1.5 millivolts peak-to-peak with 60 cps input
... 1.0 millivolt rms; 3 millivolts peak-to-peak with 400 cps input

Temperature Coefficient... Change in output voltage less than 0.03%/° C
... Change in output voltage less than 0.01%/°C

AC INPUT--105-132 volts AC at 45-440 cps; for wattage + rating see table I of pertinent model group.
+ With output loaded to full 40°C rating and input voltage 132 volts at 55-65 cps.
*... 200-250 volts AC at 45-440 cps

INPUT FUSE--When fusing of input power line is planned, use a 1.25 ampere type 3AG "SLO-BLO" fuse. Overload of the supply does not cause fuse failure.

OVERLOAD PROTECTION

Thermal. . .On all units with thermostats, the thermostat resets automatically when over-temperature condition is eliminated

Electrical...Within rated voltage range, an automatic electronic current-limiting circuit limits output current to approximately 110 percent of 40°C rated current for protection of load and power supply.

OVERSHOOT--No overshoot of output voltage under conditions of power turn-on, power turn-off, or power failure.

INPUT AND OUTPUT CONNECTIONS--Heavy duty terminal block on rear of chassis

OPERATING AMBIENT TEMPERATURE RANGE AND DUTY CYCLE--Continuous duty from -20°C to 71°C ambient with corresponding load current ratings for all modes of operation, and all mounting positions.

STORAGE TEMPERATURE-- -55°C to +85°C

CONTROLS

DC output control...Voltage adjust control permits adjustment of DC output voltage via access hole located in nameplate.

REMOTE SENSING--Provision is made for remote sensing to eliminate effect of power output lead resistance on DC regulation.

PHYSICAL DATA

Size ..... 3-3/16" H x 3-3/4" W x 6-1/2" D

Weight ..... 5lbs. net; 6 lbs. shipping wt.

Finish ..... Grey, FED STD 595 No. 26081

MOUNTING--Three surfaces, each with tapped mounting holes, can be utilized for mounting this unit. Refer to figure 9 for mounting details.

ACCESSORIES

Rack Adapters...Rack adapters LRA-4 and LRA-6, used for ruggedized mounting, with or without chassis slides, are available, as well as rack adapters LRA-3 and LRA-5 which are used for simple rack installations where chassis slides are not required.

Metered and Non-Metered Panels... Metered panels MP-3, MP-5 and Non-Metered panels P-3, P-5 are available for use with the Lambda rack adapters.

Blank Panels...Full-rack, half-rack and quarter-rack panels can be used with the Lambda rack adapters. The following chart lists the panels and rack adapters that can be utilized together.

Rack Adapter	BLANK PANELS			Metered/Non Metered Panel
	1/2 Rack	1/4 Rack	Full Rack	
LRA 3	LBP-20	LBP-10	LBP-40	MP-5, P-5
LRA 6	LBP-20	LBP-10	LBP-40	MP-5, P-5
LRA 4	LBP-50	LBP-60	LBP-30	MP-3, P-3
LRA 5	LBP-50	LBP-60	LBP-30	MP-3, P-3

Overvoltage Protector... Externally mounted, Overvoltage Protectors LMOV-1, LMOV-2 and LMOV-3 are available for use with Lambda LM Power supplies.

MODEL OPTIONS

Suffix "T" Input Option... Standard LM power supplies are available for operation with 200-250 volt, 45-440 cps input.

Suffix "Y" High Performance Option... All Lambda LM power supplies are available with high performance specifications. See italicized entries under SPECIFICATIONS AND FEATURES.

Suffix "R" Fungus Proofing Option... Standard LM power supplies can be obtained with fungus proofing treatment with MIL V 173 varnish for all fungi nutrient components.

THEORY OF OPERATION

GENERAL

The Lambda power supply circuitry consists of an AC input circuit and transformer; a bias supply consisting of an auxiliary rectifier, filter, and a zener diode regulator; and a main regulator circuit consisting of the main rectifier and filter, a series regulator, emitter follower driver, an error amplifier, a voltage amplifier, an "OR" gate, and an output voltage sensing circuit.

The circuit arrangement is shown in block diagram form in figure 7. The circuitry is discussed with reference to the block diagram and the schematic diagram.

FUNCTIONAL DESCRIPTION

Single phase input power is applied to transformer T1 through the input circuit containing thermostat S1*, which protects the supply against overheating.

The main rectifier, a full-wave rectifier (or half-wave rectifier, as applicable), provides the power which is filtered by capacitor C8 and then regulated via a series regulator and delivered to the output. Bias supply, half-wave, auxiliary rectifier CR7, provides voltage filtered by capacitor C7 and regulated by zener diode CR6 for voltage amplifier Q3 and error amplifier Q1. Zener diode CR1 and resistor R5, across the bias supply, provide a regulated temperature compensated reference voltage. Resistor R4 compensates for input voltage variations.

Operation of the voltage regulator circuit is determined by changes in the output voltage. A change in the output voltage is sensed by sensing divider R1, R3 which compares output voltage with the +S reference voltage. This provides an error voltage at junction of R1 and R3 which is amplified by error amplifier Q1, and is current amplified by emitter follower driver Q5. The amplified signal from Q5 controls the voltage across series regulator Q8 (and, as applicable Q9), which functions as the active regulating element, restoring output voltage to the proper level.

Current limit circuit operation is determined by changes in the load. When load current increases above the rated current value, the voltage drop across current sensing resistor R14* (or R15, as applicable) increases, driving OR gate diode CR3 on, and OR gate diode CR5 toward cut-off. The resulting base current supplied to voltage amplifier Q3, drives Q3 toward turn-on. With Q3 conducting, the current to driver Q5 decreases, limiting the base current to series regulator Q8 (and, as applicable Q9), which results in an increase of voltage across the series regulator and a decrease of the output voltage, effectively limiting the output current to a safe value. The current limit value is determined by the factory setting of current limit potentiometer R17*,

When operating conditions reach short circuit, the output voltage value decreases to zero and the current decreases to a predetermined current limit value and remains unchanged.

*S1 not used on models LM-251, LM-257, LM-259, LM-263, LM-265 and R17 used as current sensing resistor on these models; S1 not used on models LM-201, LM-203, LM-260, LM-205 and LM-207, LM-267, LM-268.

OPERATING INSTRUCTIONS

BASIC MODE OF OPERATION

This power supply operates as a constant voltage source provided the load current does not exceed the rated value at 40 ^{O}C. For continuous operation, load current must not exceed the rating for each ambient temperature. When load current exceeds 110% of 40^{O} C rating, both voltage and current decrease until voltage reaches zero and the current decreases to a predetermined value.

MOUNTING

When using this unit as a mounted component, a cutout must be provided to permit free-flow of air through the unit. See figure 9 for cutout sizes and specific mounting details.

CONNECTIONS FOR OPERATION

NOTE: Make all connections to the unit before applying AC input power.

Ground Connections. The Lambda power supply can be operated either with negative or positive output terminal grounded. Both positive and negative ground connections are shown in the diagrams for all suggested output connections illustrated in this manual.

Connection Terminals. Make all connections to the supply at the terminal block on the rear of the supply. Apply input power to terminals 1 and 2; always connect the ungrounded (hot) lead to terminal 1.

The supply positive terminal is brought out to terminal 6; the negative terminal to terminal 4.

NOTE: When shipped from the factory, the supply is ready for use as a local-sensing constant voltage source. Jumpers are connected at the factory as shown in figure 3. Take care to remove the appropriate jumpers for load requirements that need different supply-load connections. Refer to the appropriate connection diagram.

Supply-Load Connections. The regulation of the supply at the load may change when connecting leads of practical length are used. To minimize the effect of the output load leads, remote sensing is used. Refer to figure 1 to determine voltage drop for particular cable lenghts, wire size and current conditions. Lead lengths must be measured from supply terminals to load terminals as shown in figure 2.

Local-Sensing Connection, See Figure 3.

Remote-Sensing Connection, See Figure 4.

Programmed Voltage Connection Using External Resistor, See Figure 5. Discrete voltage steps can be programmed with a resistance voltage divider valued at nominal 200 ohms/volt output and a shorting-type switch. For continuous voltage variations, use a variable resistor with the same ohms/volt ratio in place of the voltage divider and shorting-type switch. Use low temperature coefficient resistor(s) to assure most stable operation.

Programmed Voltage Connection Using Programming Voltage, See Figure 6. The power supply voltage output can be programmed with an externally connected programming power supply. The output voltage of the programmed supply will maintain a one-to-one ratio with the voltage of the programming supply.

The programming supply must have a reverse current capability of 6 ma. minimum.

Alternatively, when supplies with less than 6 ma. reverse current capability are used, a resistor capable of drawing 6 ma. at the minimum programming voltage must be connected across the output terminals of the supply. This programming supply must be rated to handle all excess resistor current at the maximum programming voltage.

Operation After Thermostat Shutdown. The thermostat opens the input circuit only when the power supply output current exceeds the current rating specified for the operating ambient temperature, causing the unit to overheat. Do not exceed current rating specified for the operating ambient temperature. When the temperature of the unit decreases to a safe operating value, the thermostat will reset automatically.

MAINTENANCE

GENERAL

This section describes trouble analysis routine, calibration and test procedures that are useful for servicing the Lambda power supply. A trouble chart is provided as an aid for the troubleshooter. Refer to the section on SPECIFICATIONS AND FEATURES for the minimum performance standards.

TROUBLE ANALYSIS

Whenever trouble occurs, systematically check all fuses, primary power lines, external circuit elements, and external wiring for malfunction before trouble shooting the equipment. Failures and malfunctions often can be traced to simple causes such as improper jumpers and supply-load connections or fuse failure due to metal fatigue.

Use the electrical schematic diagram and block diagram, figure 7, as an aid to locating trouble causes. The schematic diagram contains various circuit voltages that are averages for normal no load operation. Measure these voltages using the conditions for measurement specified on the schematic diagram. Use measuring probes carefully to avoid causing short circuits and damaging circuit components.

CHECKING TRANSISTORS AND CAPACITORS

Check transistor with an in-circuit transistor checker. If no checker is available, transistors can be checked with an ohmmeter that has a highly limited current capability. Observe proper polarity for PNP or NPN to avoid error in measurement. The forward transistor resistance is low but never ZERO; backward resistance is always higher than the forward resistance.

Do not assume trouble is eliminated when only one part is replaced. This is especially true when one transistor fails, causing other transistors to fail. Replacing only one transistor and turning power on, before checking for additional faulty components could damage the replaced component.

When soldering semi-conductor devices, hold the lead being soldered with a pair of pliers or a commercial heat sink device placed between the component and the solder joint.

> NOTE: The leakage resistance obtained from a simple resistance check of a capacitor is not always an indication of a faulty capacitor. In all cases the capacitors are shunted with resistances, some of which have low values. Only a dead short is a true indication of a shorted capacitor.

PRINTED CIRCUIT BOARD MAINTENANCE TECHNIQUES

1. If foil is intact but not covered with solder it is a good contact. Do not attempt to cover with solder.

2. Voltage measurements can be made from either side of the board. Use a needle-point probe to penetrate to the wiring whenever a protective coating is used on the wiring. A brass probe can be soldered to an alligator clip adapted to measuring instrument.

3. Always use a heat sink when soldering transistors; a transistor pad with mounting feet is an effective heat sink.

4. Broken or damaged printed wiring is usually the result of an imperfection, strain or careless soldering. To repair small breaks, tin a short piece of hook-up wire to bridge

the break, and holding the wire in place, flow solder along the length of wire so that it becomes part of the circuitry.

5. When unsoldering components from the board never pry or force loose the part; unsolder the component by using the wicking process described below:

(a) Select a 3/16 inch tinned copper braid for use as a wick; if braid is not available, select AWG No. 14 or No. 16 stranded wire with 1/2 inch insulation removed.

(b) Dip the wick in liquid rosin flux.

(c) Place the wick onto the soldered connection and apply soldering iron onto the wick.

(d) When sufficient amount of solder flows onto the wick, freeing the component, simultaneously remove iron and wick.

TROUBLE CHART

The trouble chart is intended as a guide for locating trouble causes, and is used along with the schematic diagram.

The operating conditions assumed for the trouble chart are as follows:

(a) AC power of proper voltage and frequency is present at input terminals.

(b) Either positive or negative terminal is connected to chassis ground.

(c) The power supply is connected for constant voltage with local sensing. See schematic; dotted lines indicate jumpers connected for local sensing operation.

TROUBLE CHART

Symptom	Probable Cause	Remedy
1. No output voltage	No power input, thermostat S1 open (as applicable)	Check power source, S1, line cord and line cord plug; shut off unit, allow to cool and check ambient temperature
	Improper output terminal connection	Refer to appropriate connection diagram, and check for correct connections
	Faulty Q3, CR1, CR6	Check Q3, CR1, CR6 for short and replace as required
2. Unable to adjust output voltage	Damaged VOLTAGE ADJUST control	Check R1 for shorts and/or open; replace as required
	Supply operating as constant current source at current limit value	Remove load, check load value and check for shorts and/or improper supply-load connections; refer to appropriate diagram for correct connections

TROUBLE CHART (Cont'd)

Symptom	Probable Cause	Remedy
3. Output voltage too high	Improper output terminal connection	Refer to appropriate connection diagram, and check for correct connections
	Faulty Q1, R1, Q8 (and Q9, as applicable), Q5, or CR1	Check R1 for open; Q8 (Q9), Q5, Q1 for short; CR1 for open and replace as required.
4. Output voltage too low	Load resistance improper for unit ratings	Check load resistance value
	Faulty Q3, R14 or R15 or R17 (as applicable)	Check Q3 for short, R14 or R15 or R17 for open, replace as required
5. High ripple and unregulated DC output	Load resistance improper for unit ratings	Check load resistance value
6. High ripple	Improper ground	Connect terminal 6 or terminal 4 to ground terminal 5

PERFORMANCE CHECK

Check the ripple and regulation of the power supply using the test connection diagram shown in figure 8. Use suggested test equipment or equivalent to obtain accurate results. Refer to SPECIFICATIONS AND FEATURES for minimum performance standards.

Set the differential meter, DC VTVM (John Fluke Model 825A or equivalent) to the selected power supply operating voltage. Check the power supply load regulation accuracy while switching from the full-load to no-load condition. Long load leads should be a twisted pair to minimize AC pick-up.

Use a Variac to vary the line voltage from 105-132 or 132-105 volts AC and check the power supply line regulation accuracy on the VTVM differential meter.

Use a VTVM Ballantine 320 or equivalent, to measure rms ripple voltage of the power supply DC output. Use oscilloscope to measure peak-to-peak ripple voltage of the power supply DC output.

ADJUSTMENT OF CALIBRATION CONTROL R17

Whenever Q3, R15 or R14 or R17 are replaced, and voltage and current indications do not reflect maximum ratings, adjust R17 as follows:

NOTE: The following procedure requires that the power supply is removed from associated equipment, is on the bench at an ambient temperature of 25-30 ^{o}C, and is cold from not operating.

1. Remove AC power input to the supply.

2. Unsolder the wiper of R17 from resistor housing and turn to full CW position.

Adjustment of Calibration Control R17 (Cont'd)

3. Operate power supply for constant voltage with local sensing, connected as shown in Figure 3, with no external load.

4. Turn voltage adjust control until maximum non-derated output voltage is obtained.

5. Apply load so that output current is 130% of 40° C rating for the unit.

6. Using an oscilloscope, Tektronix 503 or equivalent, observe unit output voltage while adjusting R17 in a CCW direction. Adjust R17 until output ripple increases sharply and oscilloscope pattern changes.

7. Place a DC ammeter of appropriate scale across output terminals 4 and 6 of the supply. The meter indication shall be a maximum of 133% of 40°C rating for the unit.

8. After adjustment is completed, remove AC power input to the supply and solder wiper of R17 to resistor housing.

9. After soldering, check setting and repeat adjustment procedure if required.

SERVICE

When additional instructions are required or repair service is desired, contact the nearest office of the Lambda Electronics Corp. where trained personnel and complete facilities are ready to assist you.

Please include the power supply model and serial number together with complete details of the problem. On receipt of this information, Lambda will supply service data or advise shipping for factory repair service.

All repairs not covered by the warranty will be billed at cost and an estimate forwarded for approval before work is started.

PARTS ORDERING

Standard Components and special components used in Lambda power supply can be obtained from the factory. In case of emergency, critical spare parts are available through any Lambda office.

The following information must be included when ordering parts:

1. Model number and serial number of power supply and purchase date.

2. Lambda part number.

3. Description of part together with circuit designation.

4. If part is not an electronic part, or is not listed, provide a description, function, and location of the part.

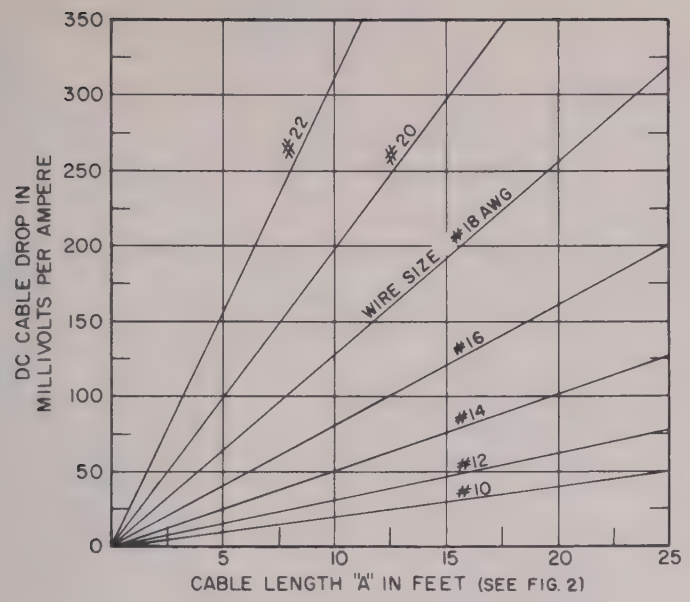


Figure 1. Cable Connection Chart

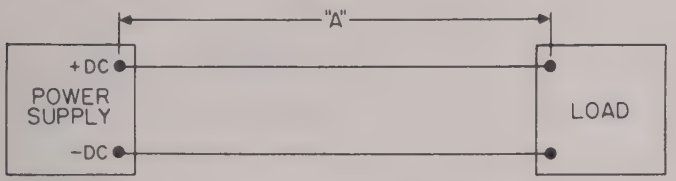
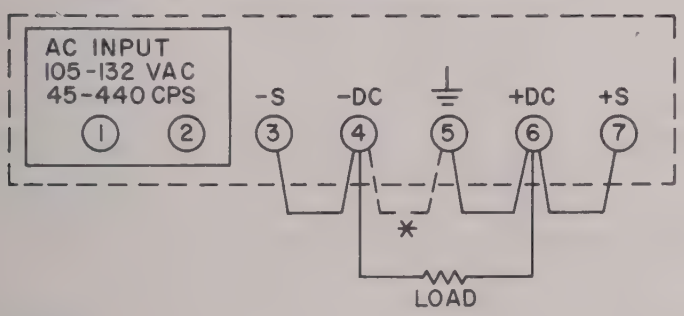
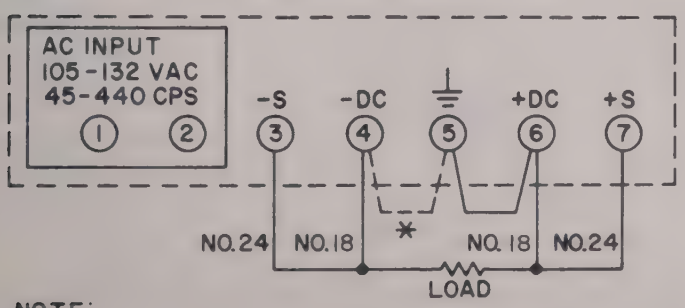


Figure 2. Cable Length "A" in Feet



NOTE:
* FOR NEGATIVE GROUND, DISCONNECT JUMPER FROM TERMINALS 5 AND 6 AND RECONNECT TO TERMINALS 4 AND 5.

Figure 3. Local Sensing Connections



NOTE:
* FOR NEGATIVE GROUND, DISCONNECT JUMPER FROM TERMINALS 5 AND 6 AND RECONNECT TO TERMINALS 4 AND 5.

Figure 4. Remote Sensing Connections

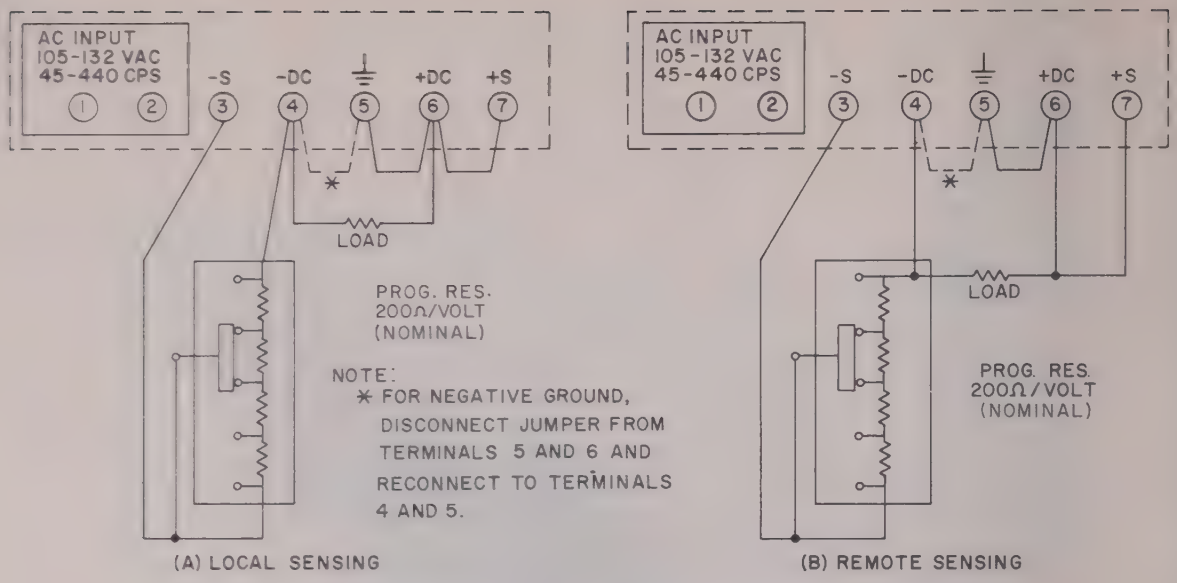


Figure 5. Programmed Voltage, with External Resistor

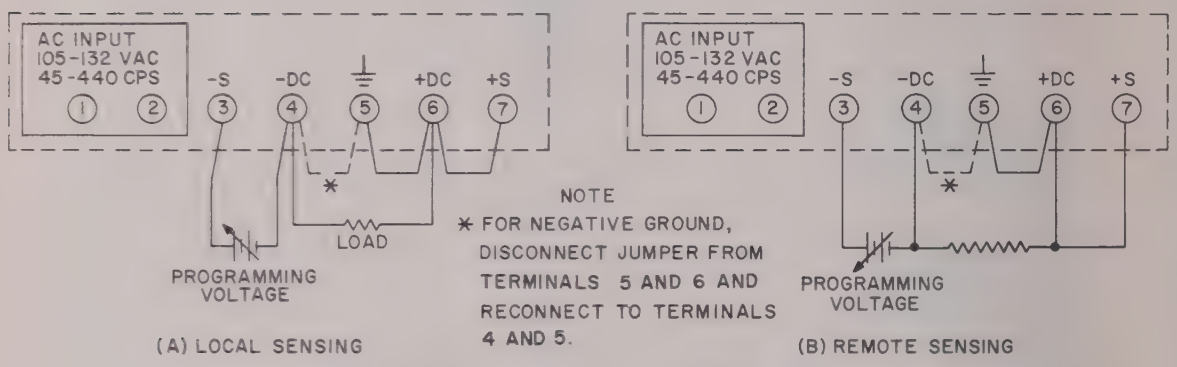


Figure 6. Programmed Voltage, with External Programming Voltage Source

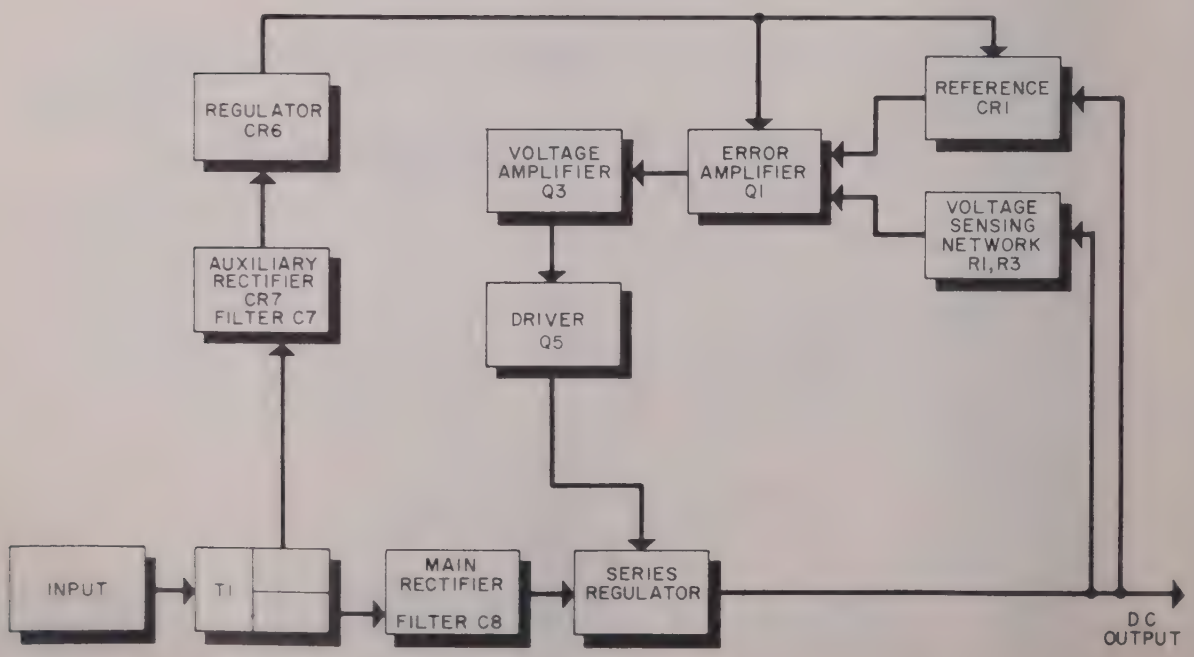
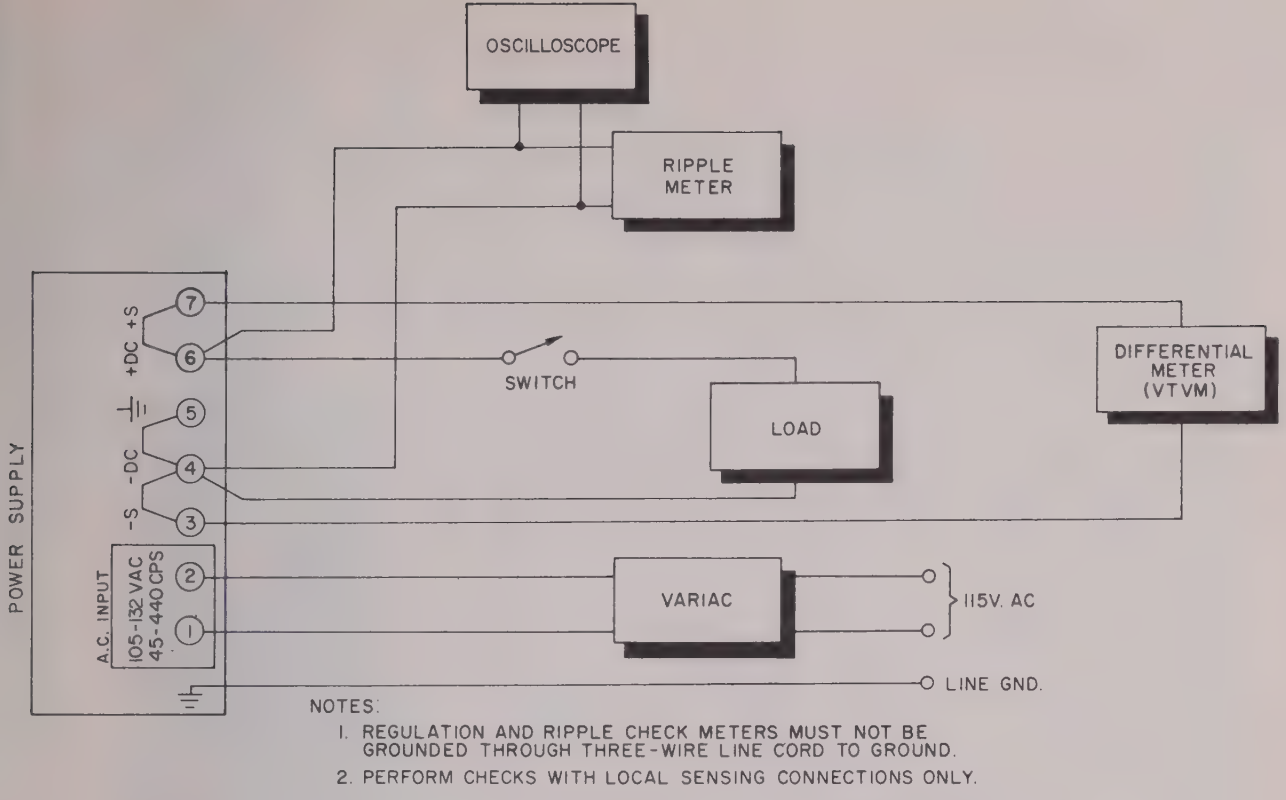


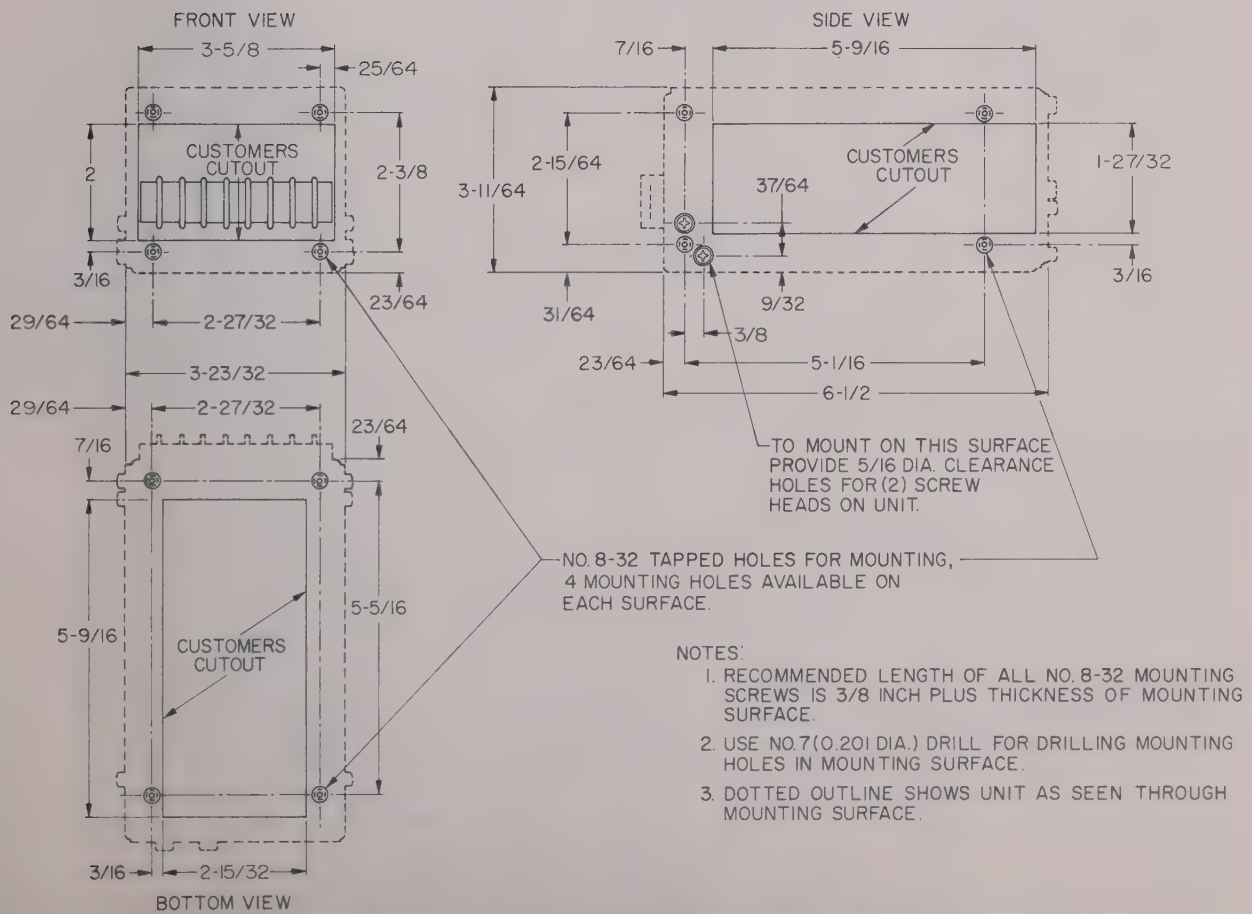
Figure 7. Typical Block Diagram



NOTES:

1. REGULATION AND RIPPLE CHECK METERS MUST NOT BE GROUNDED THROUGH THREE-WIRE LINE CORD TO GROUND.
2. PERFORM CHECKS WITH LOCAL SENSING CONNECTIONS ONLY.

Figure 8. Test Connections for Performance Checks

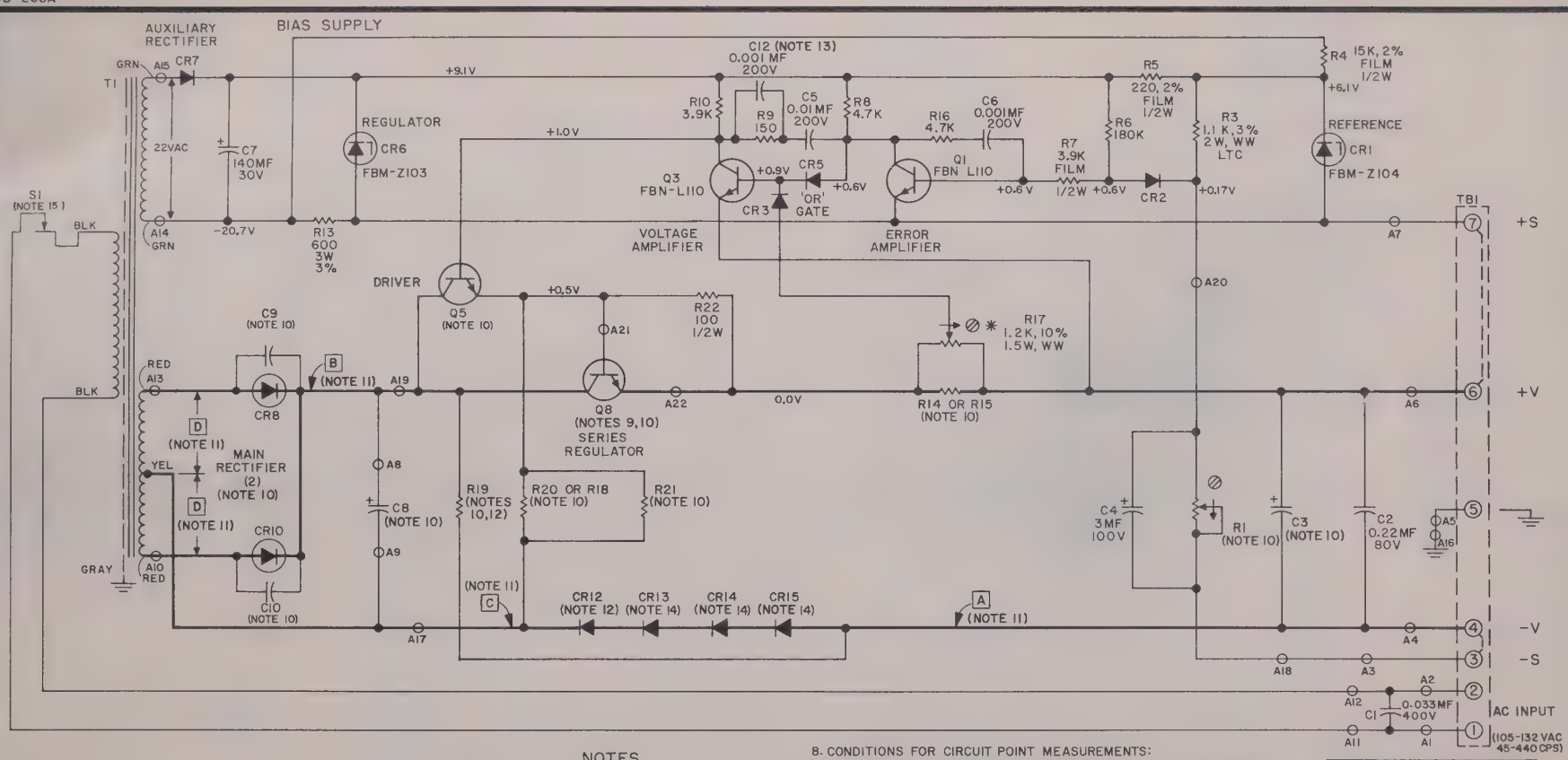


NOTES:

1. RECOMMENDED LENGTH OF ALL NO. 8-32 MOUNTING SCREWS IS 3/8 INCH PLUS THICKNESS OF MOUNTING SURFACE.
2. USE NO. 7 (0.201 DIA.) DRILL FOR DRILLING MOUNTING HOLES IN MOUNTING SURFACE.
3. DOTTED OUTLINE SHOWS UNIT AS SEEN THROUGH MOUNTING SURFACE.

Figure 9. Recommended Mounting Cutouts

SCB-260A



NOTES

1. RESISTOR VALUES ARE IN OHMS.
2. RESISTOR WATTAGE 1/4 WATT; RESISTORS ABOVE 2 WATTS ARE WIREWOUND UNLESS OTHERWISE NOTED.
3. RESISTOR TOLERANCES: COMP. ±10%; WIREWOUND ±5%; FILM ±5%; UNLESS OTHERWISE NOTED.
4. CAPACITOR TOLERANCES: ELECTROLYTIC -10%,+100%; MYLAR ±10%; UNLESS OTHERWISE NOTED.
5. SYMBOLS:
   - INDICATES CLOCKWISE ROTATION OF SHAFT.
   - INDICATES ADJUSTMENT OR CALIBRATION CONTROL.
   - INDICATES CONNECTION TO CHASSIS.
   - INDICATES ACTUAL UNIT MARKING
   - SEE INSTRUCTION MANUAL.
   - LAMBDA PT. #FBL-00-030; USE IN 4002 DIODE FOR REPLACEMENT UNLESS OTHERWISE NOTED.
   - INDICATES TERMINAL ON PRINTED WIRING BOARD 'A'.
6. DESIGNATIONS ARE LAMBDA PART NUMBERS.
7. DERATE CURRENT 10% FOR 45 - 55 CPS OR 360 - 440 CPS.
8. CONDITIONS FOR CIRCUIT POINT MEASUREMENTS: INPUT: 115VAC, 60CPS; OUTPUT: RATED MAX. VDC, NO LOAD. INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE DC UNLESS OTHERWISE NOTED. DC MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLTMETER BETWEEN +S (TERM. 7) & INDICATED POINTS UNLESS NOTED.
9. COAT BOTH SIDES OF INSULATING WAFER WITH DOW CORNING NO. 340 SILICONE GREASE.
10. SEE TABLE I FOR COMPONENT VALUES.
11. SEE TABLE I FOR VOLTAGE VALUES.
12. FOR MODEL LM202: ONLY USED ON UNITS WITH SERIAL NO. PREFIX 'A'.
13. NOT USED ON UNITS WITH SERIAL NO. PREFIXES A & B.
14. THIS PART ONLY USED ON LM-207, LM-208
15. S1 NOT USED ON MODELS LM-201, LM-203, LM-205, LM-207, & LM-260.

MODELS
LM-260
LM-261
LM-201
LM-202
LM-203
LM-204
LM-205
LM-206
LM-207
LM-208

FOR WIRING OF POWER SUPPLY TO LOAD REFER TO SUPPLY-TO-LOAD WIRING DIAGRAMS.

DOTTED CONNECTIONS SHOWN ON TB1 INDICATE JUMPERS IN PLACE FOR LOCAL SENSING CONNECTION.

THIS SCHEMATIC APPLIES TO UNITS BEARING SERIAL NO. PREFIXES A-C

SCHEMATIC DIAGRAM
REGULATED POWER SUPPLY

LAMBDA ELECTRONICS CORP. MELVILLE NEW YORK
A Veeco SUBSIDIARY

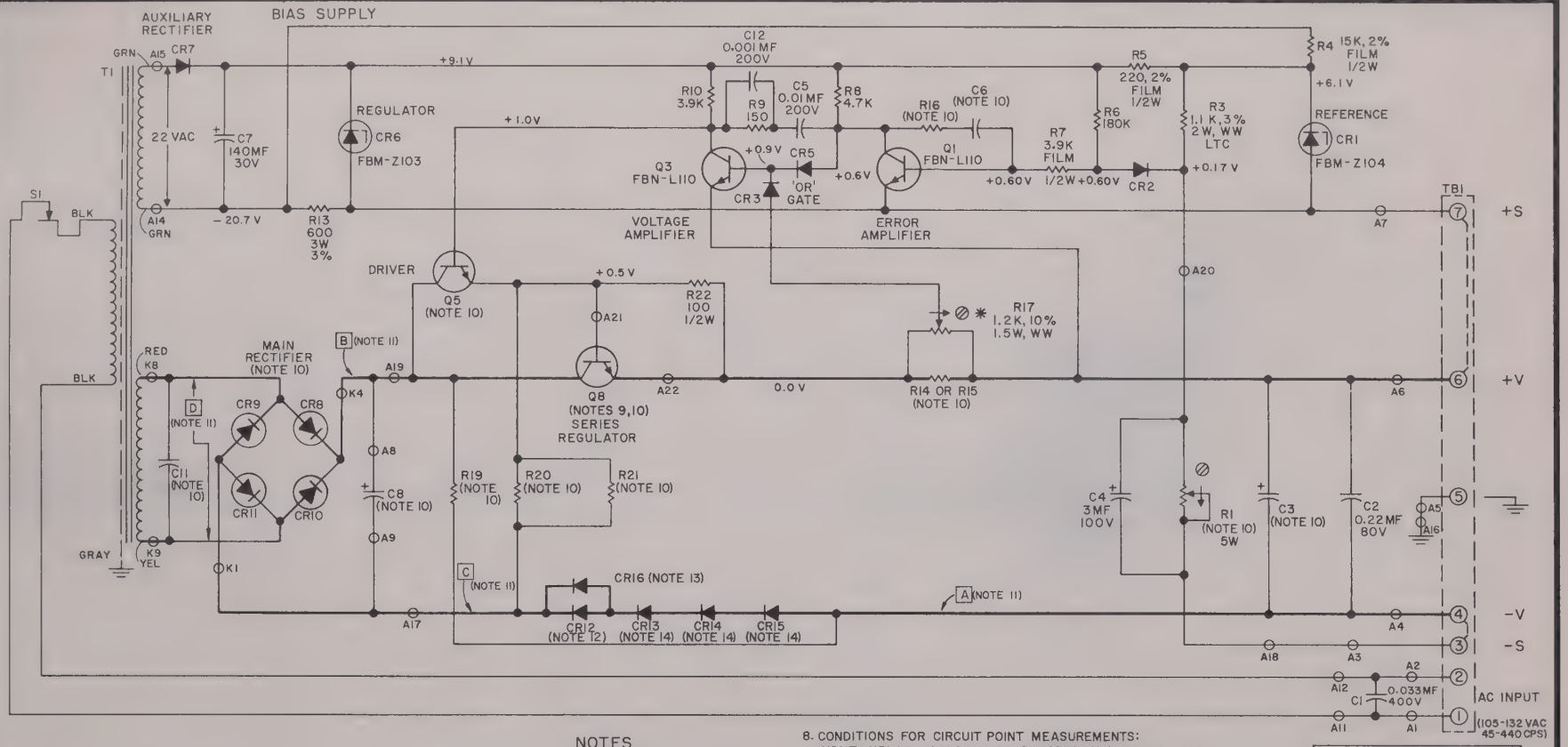
TABLE I

DATA REFERENCES FOR MODELS LM-201-LM-208, LM-260, LM-261

Model**	Voltage Range (VDC)	Max. Current (Amps)				Schematic Voltage Measurement				Schematic Components											
		40°C	50°C	60°C	71°C	A (VDC)	B (VDC)	C (VDC)	D (VAC)	C3	C6	C8	C9, C10	CR8, CR10 (FBL00-)	Q5 (FBN-)	Q8 (FBN-)	R1 ±5%, 5W	R14 or R15	R16 10%, 1/4W	R18 or R20, R21	R19 10%
LM-201	0-7	0.85	0.75	0.70	0.55	- 7.0	+17.5	- 7.6	16.0	400MF, 30V 60V SURGE	0.0068MF ±10%, 200V	1700MF, 20V 35V SURGE	0.018MF ±10%, 200V	036	L109	36603	2,200	1.5 ±3%, 3W	2,700	820 ±10%, 1W	1,800 1W
LM-202	0-7	1.7	1.5	1.4	1.1	- 7.0	+18.1	- 7.0	16.0	400MF, 30V 60V SURGE	0.0068MF ±10%, 200V	1700MF, 20V 35V SURGE	0.018MF ±10%, 200V	063	L109	36485	2,200	0.75 ±5%, 5W	2,700	*680 ±5%, 1/2W	Not Used
LM-203	0-14	0.45	0.40	0.38	0.28	-14.0	+18.5	-14.7	25.0	400MF, 30V 60V SURGE	0.001MF ±10%, 200V	1000MF, 28V 60V SURGE	0.018MF ±10%, 200V	036	L109	36603	4,500	3.0 ±3%, 3W	4,700	1800 ±10%, 1W	3,900 1W
LM-204	0-14	0.90	0.80	0.75	0.55	-14.0	+18.5	-14.7	25.0	400MF, 30V 60V SURGE	0.001MF ±10%, 200V	1000MF, 28V 60V SURGE	0.018MF ±10%, 200V	036	L109	36485	4,500	1.5 ±3%, 3W	4,700	1800 ±10%, 1W	3,900 1W
LM-205	0-32	0.25	0.23	0.20	0.15	-32.0	+31.5	-32.8	46.0	70MF, 90V 150V SURGE	Not Used	530MF, 60V 100V SURGE	0.018MF ±10%, 200V	036	L109	36605	9,000	6.0 ±3%, 3W	Not Used	1500 ±3%, 3W	27,000 1/2W
LM-206	0-32	0.50	0.45	0.40	0.30	-32.0	+31.5	-32.8	46.0	70MF, 90V 150V SURGE	Not Used	530MF, 60V 100V SURGE	0.018MF ±10%, 200V	036	L108	36487	9,000	3.0 ±3%, 3W	Not Used	2000 ±3%, 3W	27,000 1/2W
LM-207	0-60	0.13	0.12	0.11	0.08	-60.0	+41.0	-62.4	76.0	70MF, 90V 150V SURGE	Not Used	250MF, 100V 150V SURGE	0.015MF ±10%, 400V	033	L108	36606	13,000	6.0 ±3%, 3W	Not Used	4500 ±3%, 3W	47,000 1/2W
LM-208	0-60	0.25	0.23	0.21	0.16	-60.0	+41.0	-62.4	76.0 ^	70MF, 90V 150V SURGE	Not Used	250MF, 100V 150V SURGE	0.015MF ±10%, 400V	033	L108	35902	13,000	6.0 ±3%, 3W	Not Used	4500 ±3%, 3W	47,000 1/2W
LM-260	0-24	0.35	0.30	0.25	0.20	-24.0	+27.9	-24.6	38.8	70MF, 90V 150V SURGE	0.001MF ±10%, 200V	500MF, 60V 100V SURGE	0.018MF ±10%, 200V	036	L109	36603	9,000	6.0 ±3%, 3W	4,700	1500 ±3%, 3W	27,000 1/2W
LM-261	0-24	0.70	0.65	0.60	0.45	-24.0	+27.9	-24.6	38.8	400MF, 30V 60V SURGE	0.001MF ±10%, 200V	500MF, 60V 100V SURGE	0.018MF ±10%, 200V	036	L109	36487	9,000	3.0 ±3%, 3W	4,700	1800 ±10%, 1W	3,900 1W

*R18 was 820 ohms on LM-202 units with Serial No. Prefix A.
**Input power for LM-201, LM-203, LM-260, LM-205 and LM-207 is 30 watts.
^Input power for LM-202, LM-204, LM-261, LM-206 and LM-208 is 60 watts.

SCB-252A



NOTES

1. RESISTOR VALUES ARE IN OHMS.
2. RESISTOR WATTAGE 1/4 WATT; RESISTORS ABOVE 2 WATTS ARE WIREWOUND UNLESS OTHERWISE NOTED.
3. RESISTOR TOLERANCES: COMP. ±10%; WIREWOUND ±5%; FILM ±5%; UNLESS OTHERWISE NOTED.
4. CAPACITOR TOLERANCES: ELECTROLYTIC -10%,+100%; MYLAR ±10%; UNLESS OTHERWISE NOTED.
5. SYMBOLS:
   - INDICATES CLOCKWISE ROTATION OF SHAFT.
   - INDICATES ADJUSTMENT OR CALIBRATION CONTROL.
   - INDICATES CONNECTION TO CHASSIS.
   - INDICATES ACTUAL UNIT MARKING
   - SEE INSTRUCTION MANUAL.
   - LAMBDA PT. #FBL-00-030; USE IN4002 DIODE FOR REPLACEMENT UNLESS OTHERWISE NOTED.
   - INDICATES TERMINAL ON PRINTED WIRING BOARD 'A' & TERMINAL BOARD "K".
6. DESIGNATIONS ARE LAMBDA PART NUMBERS.
7. DERATE CURRENT 10% FOR 45-55 CPS OR 360-440 CPS.
8. CONDITIONS FOR CIRCUIT POINT MEASUREMENTS: INPUT: 115VAC, 60CPS; OUTPUT: RATED MAX. VDC, NO LOAD. INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE DC UNLESS OTHERWISE NOTED. DC MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLTMETER BETWEEN +S (TERM. 7) & INDICATED POINTS UNLESS NOTED.
9. COAT BOTH SIDES OF INSULATING WAFER WITH DOW CORNING NO. 340 SILICONE GREASE.
10. SEE TABLE I FOR COMPONENT VALUES.
11. SEE TABLE I FOR VOLTAGE VALUES.
12. CR12 NOT USED ON LM-252
13. CR16 ONLY USED ON LM-258, LM-262
14. THIS PART ONLY USED ON LM-266

MODELS
LM-252
LM-258
LM-262
LM-264
LM-266

FOR WIRING OF POWER SUPPLY TO LOAD REFER TO SUPPLY-TO-LOAD WIRING DIAGRAMS.

DOTTED CONNECTIONS SHOWN ON TB1 INDICATE JUMPERS IN PLACE FOR LOCAL SENSING CONNECTION.

THIS SCHEMATIC APPLIES TO UNITS BEARING SERIAL NO. PREFIXES A-C

SCHEMATIC DIAGRAM
REGULATED POWER SUPPLY

LAMBDA ELECTRONICS CORP.
MELVILLE NEW YORK
A Veeco SUBSIDIARY

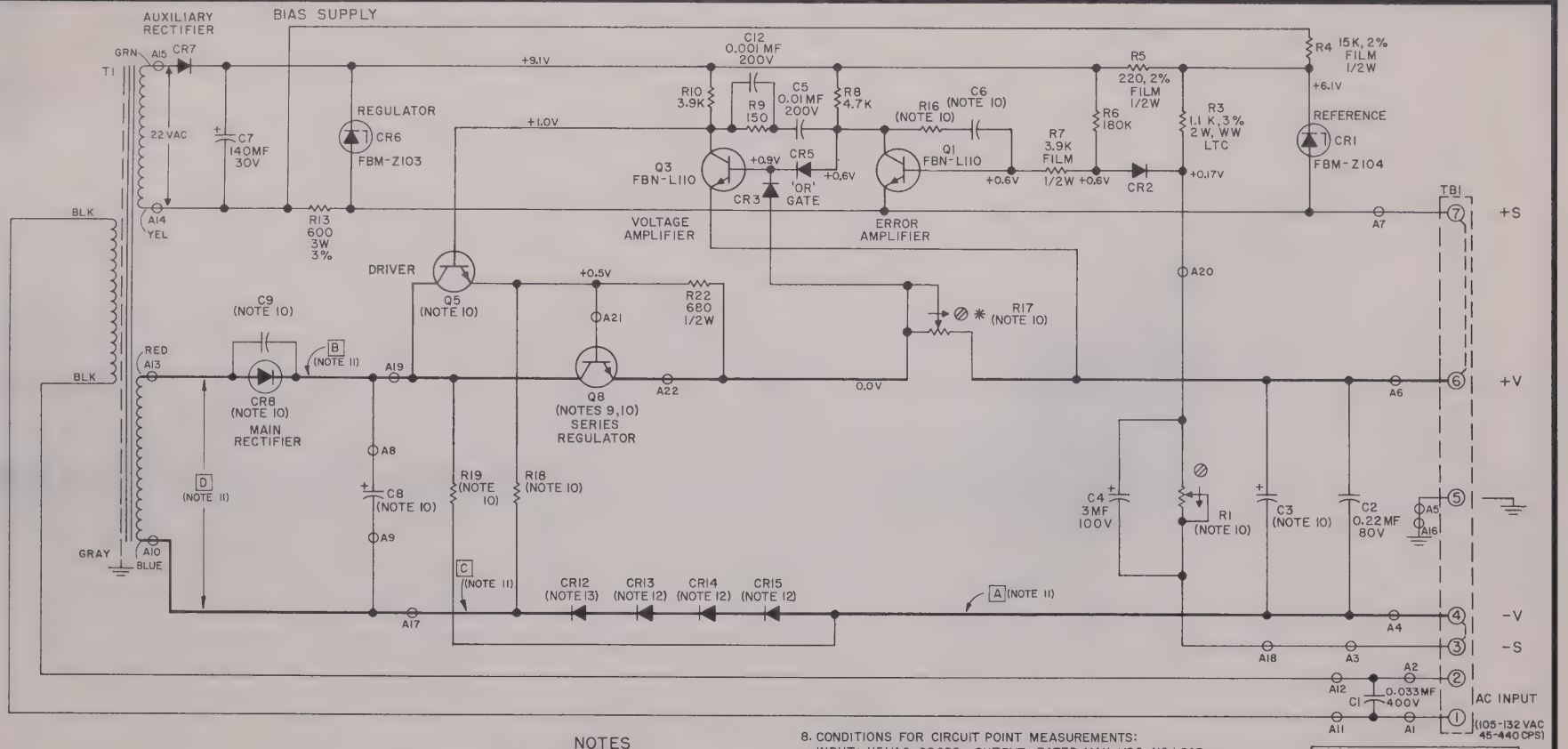
TABLE I

DATA REFERENCES FOR MODELS LM-252, LM-258,
LM-262, LM-264, and LM-266

Model*	Voltage Range (VDC)	Max. Current (Amps)				Schematic Voltages Measurement				Schematic Components											
		40°C	50°C	60°C	71°C	A (VDC)	B (VDC)	C (VDC)	D (VAC)	C3	C6	C8	C11 ±10%, 200V	CR8-CR11 (FBL-00-)	Q5 (FBN-)	Q8 (FBN-)	R1 ±5%, 5W	R14 or R15	R16 10%, 1/4W	R19	R20, R21
LM-252	0-7	2.0	1.8	1.4	1.1	- 7.0	+15.5	- 7.0	16.6	400MF, 30V, 60V SURGE	0.0068MF ±10%, 200V	1700MF, 20V, 35V SURGE	0.018MF	047	L109	36485	2,200	0.75 ±5%, 5W	2,700	Not Used	680 ±5%, 1/2W R21 Not Used
LM-258	0-14	1.2	1.1	1.0	0.80	-14.0	+22.1	-14.6	27.1	400MF, 30V, 60V SURGE	0.001MF ±10%, 200V	900MF, 35V, 60V SURGE	0.018MF	047	L109	36485	3,300	1.5 ±3%, 5W	4,700	3900 ±10%, 1W	1800 ±10%, 1W
LM-262	0-24	0.80	0.75	0.70	0.60	-24.0	+27.9	-24.6	38.8	400MF, 30V, 60V SURGE	0.001MF ±10%, 200V	500MF, 60V, 100V SURGE	0.018MF	036	L109	36487	9,000	1.5 ±3%, 3W	4,700	3900 ±10%, 1W	1800 ±10%, 1W
LM-264	0-32	0.66	0.60	0.50	0.32	-32.0	+34.6	-32.6	49.5	70MF, 90V, 150V SURGE	Not Used	500MF, 60V, 100V SURGE	0.018MF	036	L108	36487	9,000	3.0 ±3%, 3W	Not Used	27,000 ±10%, 1/2W	2000 ±3%, 3W
LM-266	0-60	0.35	0.31	0.28	0.25	-60.0	+41.0	-62.5	78.0	70MF, 90V, 150V SURGE	0.001MF ±10%, 200V	200MF, 100V, 150V SURGE	0.015MF	036	L108	35902	13,000	6.0 ±3%, 3W	4,700	47,000 ±10%, 1/2W	4500 ±3%, 3W

*Input power for all units is 70 watts.

SCB-251A



NOTES

1. RESISTOR VALUES ARE IN OHMS.
2. RESISTOR WATTAGE 1/4 WATT; RESISTORS ABOVE 2 WATTS ARE WIREWOUND UNLESS OTHERWISE NOTED.
3. RESISTOR TOLERANCES: COMP. ±10%; WIREWOUND ±5%; FILM ±5%; UNLESS OTHERWISE NOTED.
4. CAPACITOR TOLERANCES: ELECTROLYTIC -10%,+100%; MYLAR ±10%; UNLESS OTHERWISE NOTED.
5. SYMBOLS:
   - ↓ INDICATES CLOCKWISE ROTATION OF SHAFT.
   - ⊘ INDICATES ADJUSTMENT OR CALIBRATION CONTROL.
   - ⏚ INDICATES CONNECTION TO CHASSIS.
   - ▭ INDICATES ACTUAL UNIT MARKING
   - ✱ SEE INSTRUCTION MANUAL.
   - ⊣▸ LAMBDA PT. #FBL-00-030; USE IN 4002 DIODE FOR REPLACEMENT UNLESS OTHERWISE NOTED.
   - ⊖ INDICATES TERMINAL ON PRINTED WIRING BOARD 'A'.
6. DESIGNATIONS ARE LAMBDA PART NUMBERS.
7. DERATE CURRENT 10% FOR 45-55 CPS OR 360-440 CPS.
8. CONDITIONS FOR CIRCUIT POINT MEASUREMENTS: INPUT: 115 VAC, 60 CPS; OUTPUT: RATED MAX. VDC, NO LOAD. INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE DC UNLESS OTHERWISE NOTED. DC MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLTMETER BETWEEN +S (TERM. 7) & INDICATED POINTS UNLESS NOTED.
9. COAT BOTH SIDES OF INSULATING WAFER WITH DOW CORNING NO. 340 SILICONE GREASE.
10. SEE TABLE I FOR COMPONENT VALUES.
11. SEE TABLE I FOR VOLTAGE VALUES.
12. THIS PART ONLY USED ON LM-265
13. THIS PART NOT USED ON LM-251

MODELS
LM-251
LM-257
LM-259
LM-263
LM-265

FOR WIRING OF POWER SUPPLY TO LOAD REFER TO SUPPLY-TO-LOAD WIRING DIAGRAMS.

DOTTED CONNECTIONS SHOWN ON TB1 INDICATE JUMPERS IN PLACE FOR LOCAL SENSING CONNECTION.

THIS SCHEMATIC APPLIES TO UNITS BEARING SERIAL NO. PREFIXES A-C

SCHEMATIC DIAGRAM
REGULATED POWER SUPPLY

LAMBDA ELECTRONICS CORP.
MELVILLE NEW YORK
A Veeco SUBSIDIARY

TABLE I

DATA REFERENCES FOR MODELS LM-251, LM-257
LM-259, LM-263, and LM-265

		Max. Current (Amps)				Schematic Voltage Measurement				Schematic Components											
Model*	Voltage Range (VDC)	40°C	50°C	60°C	71°C	A (VDC)	B (VDC)	C (VDC)	D (VAC)	C3	C6	C8	C9 10%	CR8 (FBL-00-)	Q5 (FBN-)	Q8 (FBN-)	R1 5%, 5W	R16 10%, 1/2W	R17 10%, 3W	R18	R19
LM-251	0-7	0.35	0.31	0.29	0.27	-7.0	+14.4	-7.0	15.5	400MF, 30V 60V SURGE	0.0068MF ±10%, 200V	1700MF, 20V, 35V SURGE	0.018 200V	036	L109	36486	2,200	2,700	10	680 ± ±5% 1/2W	Not Used
LM-257	0-14	0.27	0.24	0.23	0.22	-14.0	+22.1	-14.6	26.5	400MF, 30V 60V SURGE	0.001MF ±10%, 200V	1000MF, 60V, 100V SURGE	0.018 200V	036	L109	36486	3,300	4,700	10	1,800 ±10%, 1W	3,900 ±10%, 1W
LM-259	0-24	0.18	0.16	0.15	0.14	-24.0	+24.9	-24.6	35.8	70MF, 90V 150V SURGE	0.001MF ±10%, 200V	500MF, 60V, 100V SURGE	0.018 200V	036	L109	36488	9,000	4,700	10	1,500 ±3%, 3W	27,000 ±10%, 1/2W
LM-263	0-32	0.14	0.12	0.11	0.10	-32.0	+32.0	-32.6	46.6	70MF, 90V 150V SURGE	Not Used	500MF, 60V, 100V SURGE	0.018 200V	036	L108	36488	9,000	Not Used	10	1,500 ±3%, 3W	27,000 ±10%, 1/2W
LM-265	0-60	0.08	0.07	0.07	0.06	-60.0	+49.6	-62.4	81.0	70MF, 90V 150V SURGE	Not Used	200MF, 100V, 150V SURGE	0.015 400V	033	L108	35903	13,000	Not Used	20	4,500 ±3%, 3W	47,000 ±10%, 1/2W

*Input power for all units is 20 watts.

5-Year
Guarantee
We warrant each instrument manufactured by us, and sold by us or our authorized agents, to be free from defects in material and workmanship, and that it will perform within applicable specifications for a period of five years after original shipment. Our obligation under this guarantee is limited to repairing or replacing any instrument or part thereof, (except tubes and fuses) which shall, within five years after delivery to the original purchaser, be returned to us with transportation charges prepaid, prove after our examination to be thus defective.
We reserve the right to discontinue instruments without notice, and to make modifications in design at any time without incurring any obligation to make such modifications to instruments previously sold.

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